

MARK SCHEME for the October/November 2014 series

4024 MATHEMATICS (SYLLABUS D)

4024/22

Paper 2, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Question	Answers	Mark	Part Marks
1 (a) (i)	30%	2	M1 for figs($5625 \div 18750$) or SC1 for 70(%) as final answer
(ii)	305	3	M1 for $(13125) \times \frac{22}{100}$ oe and M1 for $\frac{18750 - \text{their } 2887.5}{52}$
(iii)	15 000	2	M1 for $x + \frac{25x}{100} = 18750$ oe or B1 for $\div 125$
(b) (i)	65400	1	
(ii)	294	1	
(iii)	877	2	B1 for use of the quotient of the rates
2 (a) (i)	23	1	
(ii)	90 with reason	1	
(iii)	Parallel lines established	1	
(b)	Convincing argument	3	This must have e.g. $XQ = XY$ justified. If there is no justification, then MAX B2 from B1 for $XQ = XY$ oe And B1 for relating this to the perimeter of PXZ Or B1 for equal (alternate or bisected) angles
3 (a)	$\frac{1}{16}$ or 0.0625	1	
(b)	$\frac{42}{256}$ or 0.164 oe	3	B2 for $(2) \times \frac{7}{16} \times \frac{3}{16}$ or B1 for both $\frac{7}{16}$ and $\frac{3}{16}$ or SC1 after 0 for $\frac{7}{40}$
(c) (i)	26	1	
(ii)	$m = 5 \quad n = -3$	2	B1 for one correct or M1 for correct substitution and evaluation of the other variable or for an equation in one variable
(d)	$p = 17$	2	M1 for $p \times \text{their } m - 4 \times \text{their } n (= 97)$ oe

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4	(a) (i)	105	2	B1 for $\left(\frac{1}{2}\right) \times 7 \times 3 \times 10$ or M1 for Area of cross section $\times 10$ soi
	(ii)	197.2 (m ²)	4	M1 for $3^2 + 7^2$ and M1 for area of one triangular face and M1 for area of one rectangular face
	(b) (i)	0.845	2	M1 for $\frac{h}{2} = \sin 25$ oe
	(ii)	0.280	2	M1 for $\frac{y}{0.6} = \tan[\dots]$ oe or SC1 for 25
5	(a)	63.7 or 63.6 (m)	2	M1 for $\pi \times \frac{d}{2} = 100$
	(b)	9540 to 9560	3ft	M1 for πr^2 soi and M1 for <i>their</i> circular area + $100 \times \text{their (a)}$
	(c) (i)	18.7 to 19.0 (m)	3ft	M1 for $2\pi R$ And M1 for <i>their</i> $2\pi R - 200$ or $\pi R - 100$
	(ii)	30.8 to 31.1	2ft	M1 for $\frac{\theta}{360} \times 2\pi r$ oe
6	(a)	Correct shape ABCD	4	B1 for $\widehat{ABC} = 56$ B1 for $\widehat{BAD} = 104$ M1 line $CD \parallel AB$ A1 for perpendicular length 4.5
	(b)	115 – 125 m	2ft	M1 for <i>their</i> CD
7	(a) (i)	Convincing argument	3	www e.g. need to see b – a and $\frac{5}{3}(\mathbf{b} - \mathbf{a})$ B1 for $\overrightarrow{DE} = \mathbf{b} - \mathbf{a}$ oe B1 for $\overrightarrow{DB} = \frac{2}{3}\mathbf{a}$ or $\overrightarrow{EC} = \frac{2}{3}\mathbf{b}$ oe soi
	(ii)	9 : 25 oe	2	B1 for at least 3 : 5 oe seen
	(b) (i)	Triangle with vertices (6, 1), (10, 1), (10, 4)	2	B1 for two vertices correct
	(ii)	Stretch(ing)	1	
	(iii)	$\begin{pmatrix} 2 & 0 \\ 2 & 1 \end{pmatrix}$	2	B1 for one error or M1 for multiplication in the correct order

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(iv)	$\begin{pmatrix} 1 & 0 \\ 2 & -1 \\ -1 & 1 \end{pmatrix}$	2ft	B1 for $\frac{1}{2}$ or $\begin{pmatrix} 1 & 0 \\ -2 & 2 \end{pmatrix}$ or <i>their</i> ft values
8 (a) (i)	2.24	1	
(ii)	$(h=)\frac{T^2 g}{4\pi^2}$ oe	3	M1 for $T^2 = \frac{4\pi^2 h}{g}$ oe and M1 for any correct transposition at any stage
(b)	14	2	B1 for 42 or 16 or M1 for $45 - p - 3 = 2p$
(c)	-5.5 oe	3	M1 for $3(2x - 3) + 4(5 - x)$ oe soi and M1 for $6x - 4x = 9 - 20$ soi oe
(d)	-0.41 -3.26	3	B1 for $\sqrt{11^2 - 4 \times 3 \times 4}$ soi and B1 for $\frac{-11 \pm \sqrt{\text{their} 73}}{2 \times 3}$ After B1 or B0 so far M1 for both real values of $\frac{p \pm \sqrt{q}}{r}$
9 (a) (i)	11.05 confirmed	1	
(ii)	39.1° or 39.2°	2	M1 for $\frac{1}{2} \times 5 \times 7 \times \sin PQR$
(iii)	136.3°	3	M1 for $8 \times 2 \times \sin ZWX = \frac{1}{2} \times 4 \times 6 \times \sin 67$ oe and A1 for 43.7° soi or M1 for $180 - \text{their} 43.7$ soi
(b) (i)	6.16	3	M2 for $9^2 + 12^2 - 2 \times 9 \times 12 \times \cos 30$ soi or M1 for cosine formula with 1 error and A1 for 412 (soi by 20.3), 131.5 (soi by 11.5) or 117 (soi by 10.8)
(ii)	41.4	3	M2 for $\cos CAM = \frac{9^2 + 12^2 - 12.5^2}{2 \times 9 \times 12}$ oe or M1 for $12.5^2 = 9^2 + 12^2 - 2 \times 9 \times 12 \cos \theta$ oe After 0, SC1 for <i>their</i> A - 30, or one of M or C

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10 (a)	11 11	1	
(b)	correct scales, plots (ft) and curve	3	P2 correct scales and at least 7 plots (ft) or All plots correct ft or P1 for atleast 7 plots (ft) or Correct scales drawn
(c)	2 (± 0.5)	2ft	Dependent on tangent drawn at $x = 3$ M1 for tangent at $x = 3$
(d) (i)	-5 cao	1	
(ii)	(a) -1 (b) 5	2	B1 for either
(e)	(0.6) (3.4)	3ft	B1 for $x^2 - 4x - 1 = -3$ soi and B1 for the line $y = -3$ or M1 for $x^2 - 4x - 1 = k$ and A1 for the line $y = k$ SC3 for 0 for new curve drawn
11 (a)	histogram correct	3	H2 for four columns correct or H1 for one correct frequency density
(b) (i)	correct plots and give curve	2	P1 for at least 4 correct plots
(ii)	(a) (195)(g)	1ft	
	(b) 72 to 88(g)	2ft	B1 for 152 to 158 and 230 to 240 Or M1 for UQ – LQ
(iii)	50 78 72 32 4	1	
(iv)	(a) 36 cao	1	
	(b) 85 or 86 or ft (th Percentile)	2ft	B1 for 15 or 14.4 or ft Or M1 for subtraction from 240 or 250